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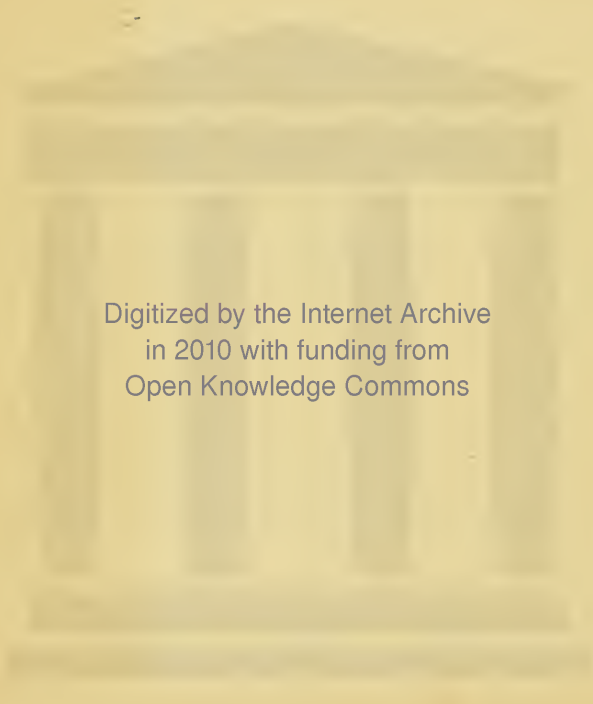
Bridgeport's improve

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BRIDGEPORT'S IMPROVED SEWERAGE SYSTEM

BY

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BRIDGEPORT'S IMPROVED SEWERAGE SYSTEM.

By James A. McElroy, City Engineer, Bridgeport, Conn.

In 1906 the Common Council of the City of Bridgeport authorized the mayor to appoint a special commission to investigate the existing sewer conditions and formulate, if possible, a new sewer system to meet the present and future needs of the City. The well known firm of Hering & Fuller was secured by the commission, and their report, submitted in the spring of 1908, has served as a guide for all sewers built since that time.

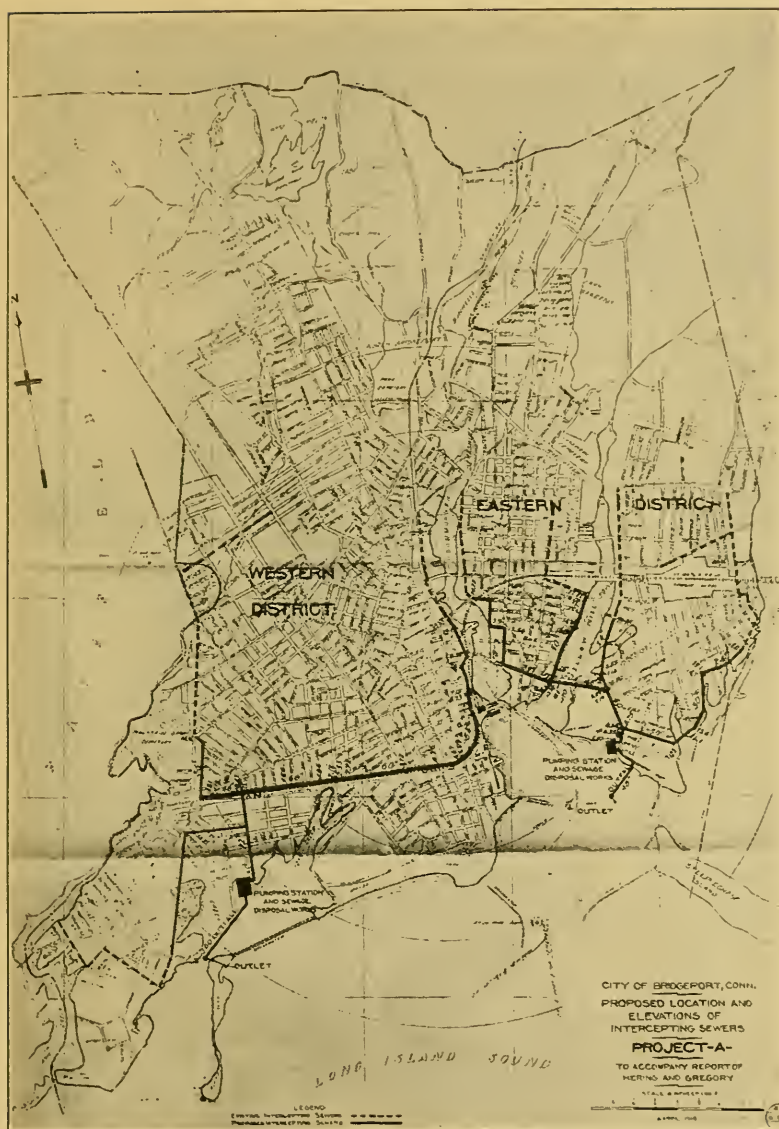
In the past all sewers in Bridgeport had been built on the combined system, that is, the same sewers carried both storm water and house sewage. These sewers, many of which were too small, emptied into the nearest tide water. The Pequonnock River which runs through the center of the city and naturally divides the city into two districts, which are now known as the Eastern and Western Sewage Districts, had about 26 sewers emptying into it, while Ash Creek which runs along the western edge of the city had 4, and Johnsons Creek, the eastern boundary, had 12. There were 8 sewers flowing into Yellow Mill Pond, in the center of the eastern district and 9 into Cedar and Burr Creek in the western district.

It was realized that the city could not continue indefinitely emptying sewage into these small streams some of which were hardly more than mud flats at low tide, and that at some time in the future it would all have to be collected and discharged into the sound through long outfalls, either with or without treatment.

The topography of Bridgeport is such that large areas near the sound are very low, and the Pequonnock River and other streams extend so far into the land at tidewater level, that it would be impossible to collect the sewage and deliver it either to outfalls or disposal work without pumping. To collect large quantities of storm water in combined sewers and then pump it, would add greatly to the cost of construction of the trunk sewers and to the pumping cost, so Hering & Fuller recommended separate sewers for rainwater wherever practicable, with storm water overflows



STARS SHOW OLD SEWER OUTLETS.



INTERCEPTORS AND PUMPING STATION.

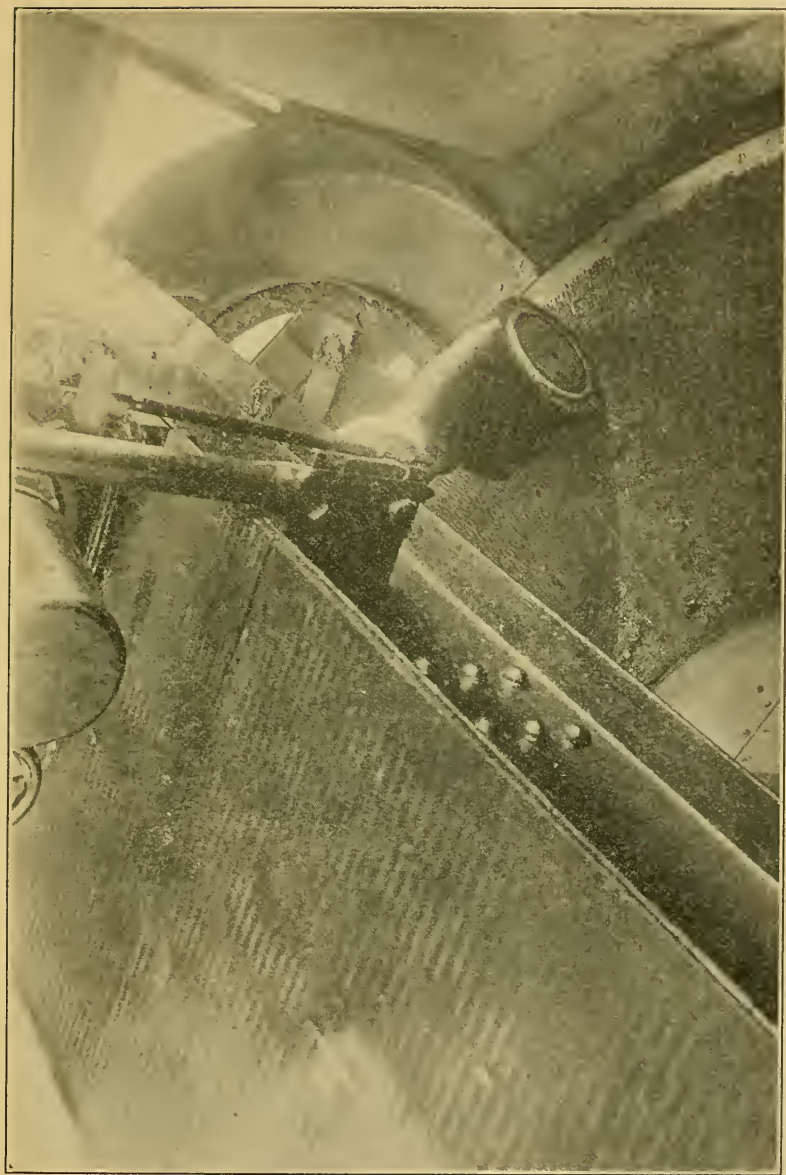
in some of the older sections of the city where the combined system would have to be retained.

They considered the city naturally divided into two districts by the Pequonnock River, and planned a pumping station and system of intercepting sewers for each district. It was their opinion that by carrying the outfall to deep water, i. e., 20 feet to 25 feet, no further treatment would be required; but suggested that when sites were acquired for the pumping stations, sufficient land be secured to enable the city to build treatment plants, if desired at some future time.

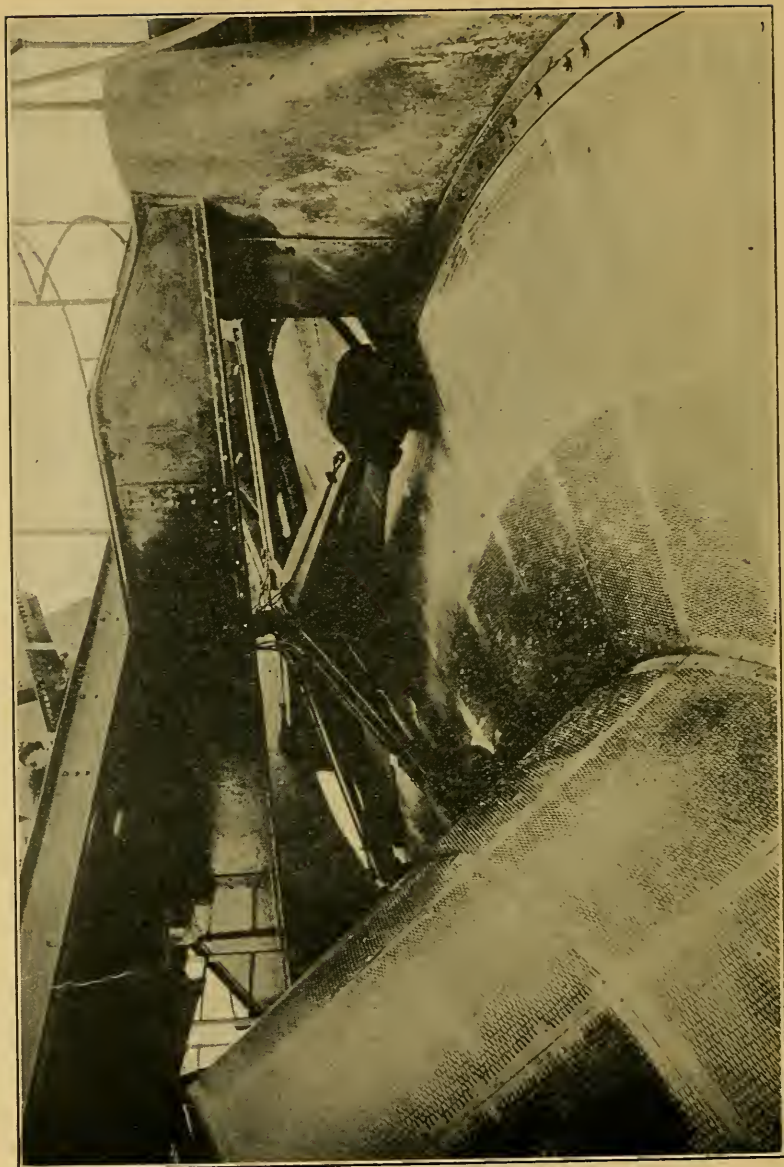
By 1916 practically all the interceptors had been completed down as far as the sewage would discharge by gravity. No further extensions of the interceptors could be made until the pumping stations were built. The firm of Hering & Gregory, successors to Hering & Fuller, were asked to review the work done to date and recommend a program for the future. They considered the advisability of bringing the sewage of the entire city to one treatment plant located on Steeplechase Island, but finally decided in favor of the original plan of Hering & Fuller which divided the city into two districts with a complete plant for each district.

As the Western District was the more important it was decided to finish that first; so contracts were let for the construction of the Railroad Avenue and Bostwick Avenue interceptor, and plans were prepared for the Western District Pumping Station at the foot of Bostwick Avenue.

The consulting engineers recommended an Imhoff tank sewage treatment plant and designed the pumping station accordingly. But, although the city did not intend to build the treatment works at this time, before letting the contract for the pumping station it was decided to investigate sewage treatment in other cities. So a committee consisting of the City Engineer, the Director of Public Works, the President of the Paving and Sewer Commission and the chairman of the committee on sewers of the common council, visited a number of plants including Fitchburg, Worcester, Rochester, Brooklyn, Baltimore, Plainfield and Wildwood, N. J. It was the opinion of a majority of this committee that the Riensch-Wurl fine screen method of sewage treatment was the most appropriate system for Bridgeport.



RIENSCH-WURL SCREEN. SCREEN ENTERING BRUSH SPHERE.



SCREEN LEAVING BRUSH SPHERE.

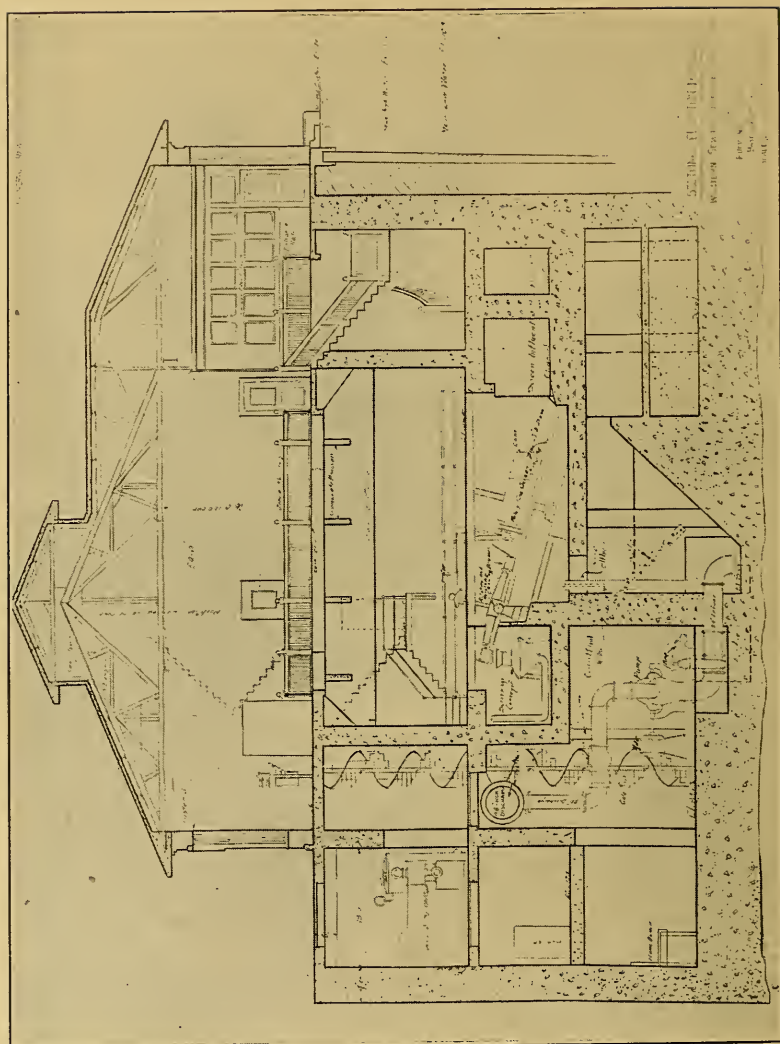
The report of this committee was submitted to two prominent sanitary engineers, George W. Fuller and George A. Johnson, for their advice. They approved of the committee's report; so new plans were prepared for the Western District pumping station, including screening and pumping equipment to take care of the present sewage of the district, with provisions for the installation of additional equipment when required in the future.

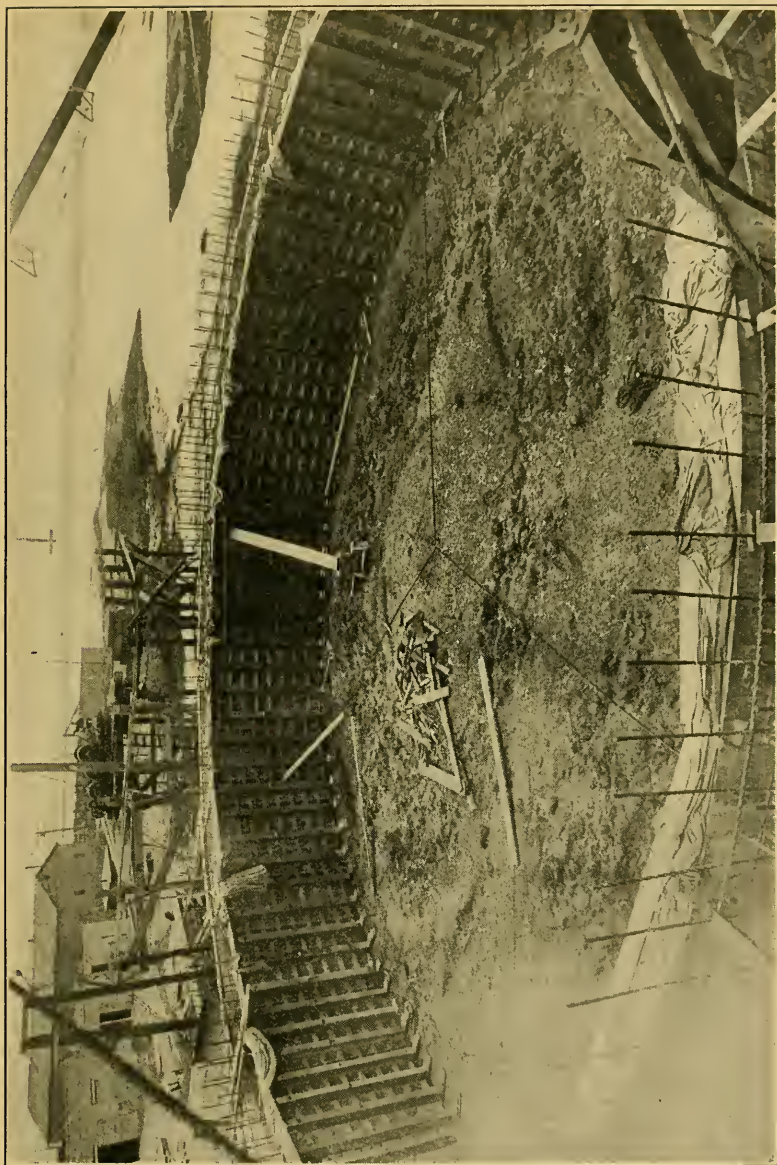
The principal reasons which led the committee to decide on the fine screen rather than the Imhoff tank method of treatment was the uncertainty of the action of Imhoff tanks. It was noted that several Imhoff plants, designed by competent engineers, were unsatisfactory, while few of the plants which were giving satisfactory service were handling the amount of sewage for which they were designed. As Bridgeport's Western Treatment Plant was to be located on the southwest edge of a well populated district, with the prevailing winds coming from the southwest, it was thought best not to run the risk of having another such experience as they had in Plainfield, where they have finally had to install a Riensch-Wurl fine screen ahead of their Imhoff tanks.

The original Hering & Fuller report recommended disposal of Bridgeport sewage by dilution. The process finally adopted was that of clarification by fine screens, followed by dilution. If further treatment is desired at some future time, the outfall can be extended, or if necessary additional treatment works can be built on land.

The flow line of the interceptor at the plant is at elevation 100, 22 feet below the street level and 10 feet below mean low water. Several combinations of screens and pump were studied including the plan of having high level screens following the pumps, so that the screened effluent would flow by gravity to the outfall. This scheme would have saved something on the cost of construction of the station, but it was discarded mainly because the screens would be more effective if installed ahead of the pumps.

In the plant finally decided upon, the sewage from the 71-inch interceptor flows through the sluice gate to a bar screen at elevation 100, thence through a concrete channel to the R-W Screens. The screened effluent flows over an adjustable weir to the sump at elevation 80 and is then lifted by the pumps to the force main at elevation 105.





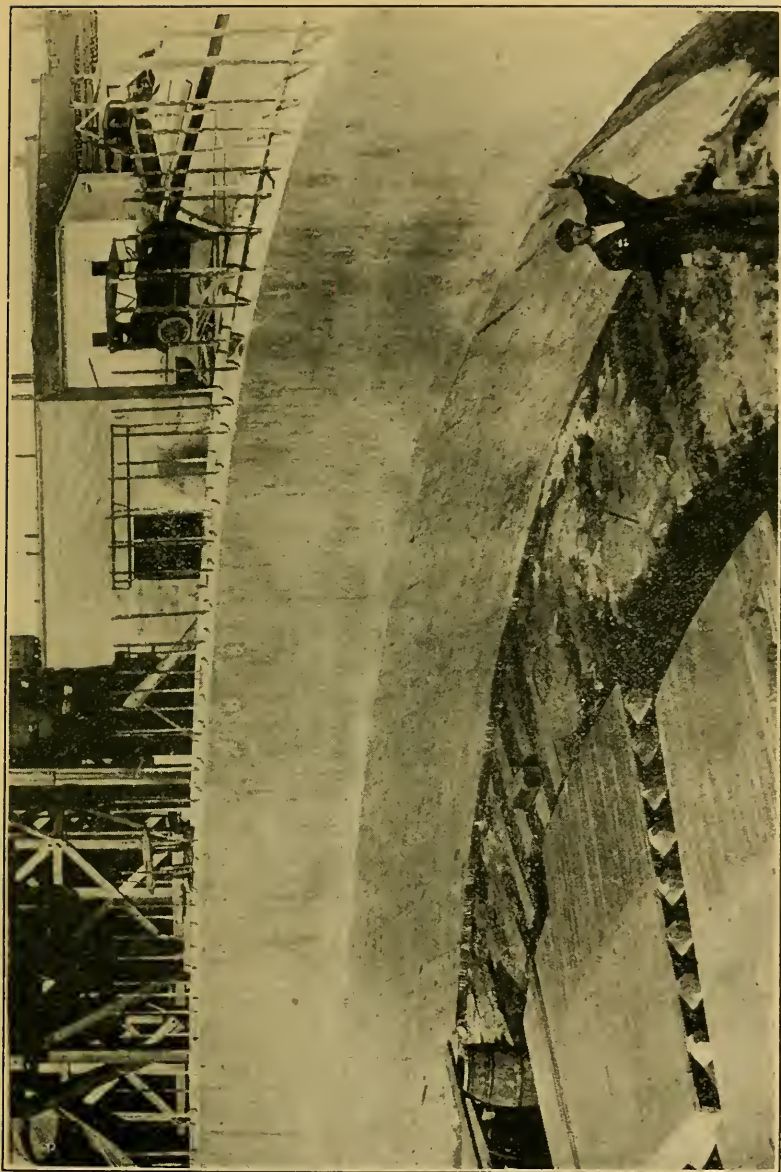
FORMS IN PLACE FOR FIRST RING.

The plant is designed for three Riensch-Wurl screens, to handle a total dry-weather flow of 35 million gallons per day. The estimated population of the district when fully developed is 180,000. As the present population of the district is in the neighborhood of 100,000, two screens will be installed now and the third one when needed. The R-W Screen consists of a circular disc 22 feet in diameter inclined at an angle of 15 degrees to the horizontal. A truncated cone 12 feet in diameter, at the base, is centrally mounted on the disc. The surface of both disc and cone consists of a number of removable bronze plates, perforated with slots two inches long and $3/64$ of an inch wide. The lowest point of the disc is set at the elevation of the influent, and the slope is such that about one-third of the disc will be above the surface of the water.

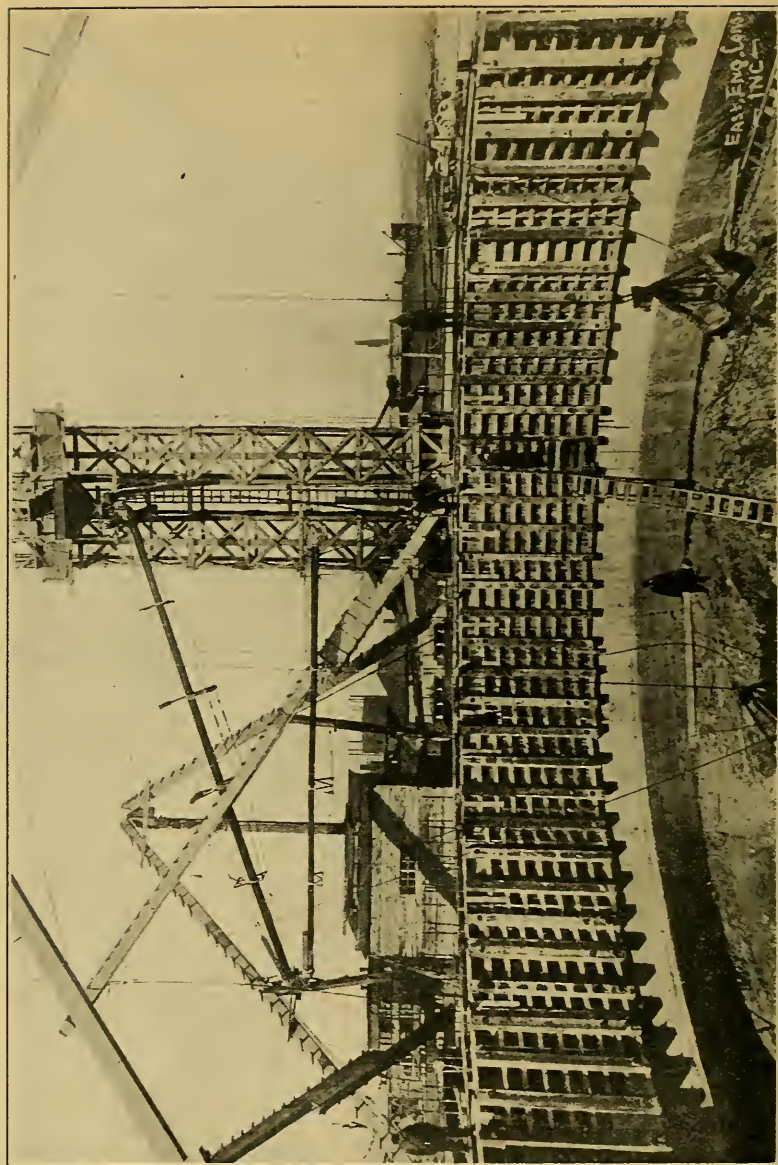
The sewage flows on to the screen which is revolving at a rate of about one revolution in two minutes. The liquid passes through the perforations in the disc and flows over the weir into the pump sump. The suspended solids, which are retained on the screen are lifted out of the water as the screen revolves, and are brushed off the screen into the hopper of the screening conveyor system. The brushes are cylindrical and are carried on a revolving spider which is mounted on a shaft parallel with the main disc shaft. These brushes work on the same principle as a street sweeper, which is carried along the street mounted on a truck and at the same time is revolving and brushing the refuse ahead of it.

The screenings are conveyed from the hopper to the storage tanks by a pneumatic system which does away with the necessity of handling it in open cans or on an open conveyor-belt. From the storage tank which is located 10 feet above the street level, the screenings will be dropped into tank wagons, carted to the town farm and buried.

The pumping equipment consists of two 20-inch horizontal centrifugal pumps each having a capacity of 15 million gallons per day and two 15-inch horizontal centrifugal pumps with a capacity of eight million gallons per day each. These pumps will be direct connected to electric motors, controlled by floats in the pump sump. The floats are adjustable and electrically connected to switches and automatic motor starters, mounted on panels of the main switch board.



FIRST RING AFTER FORMS WERE REMOVED.



FORMS IN PLACE FOR SECOND RING. SHOWING METHOD OF EXCAVATING.

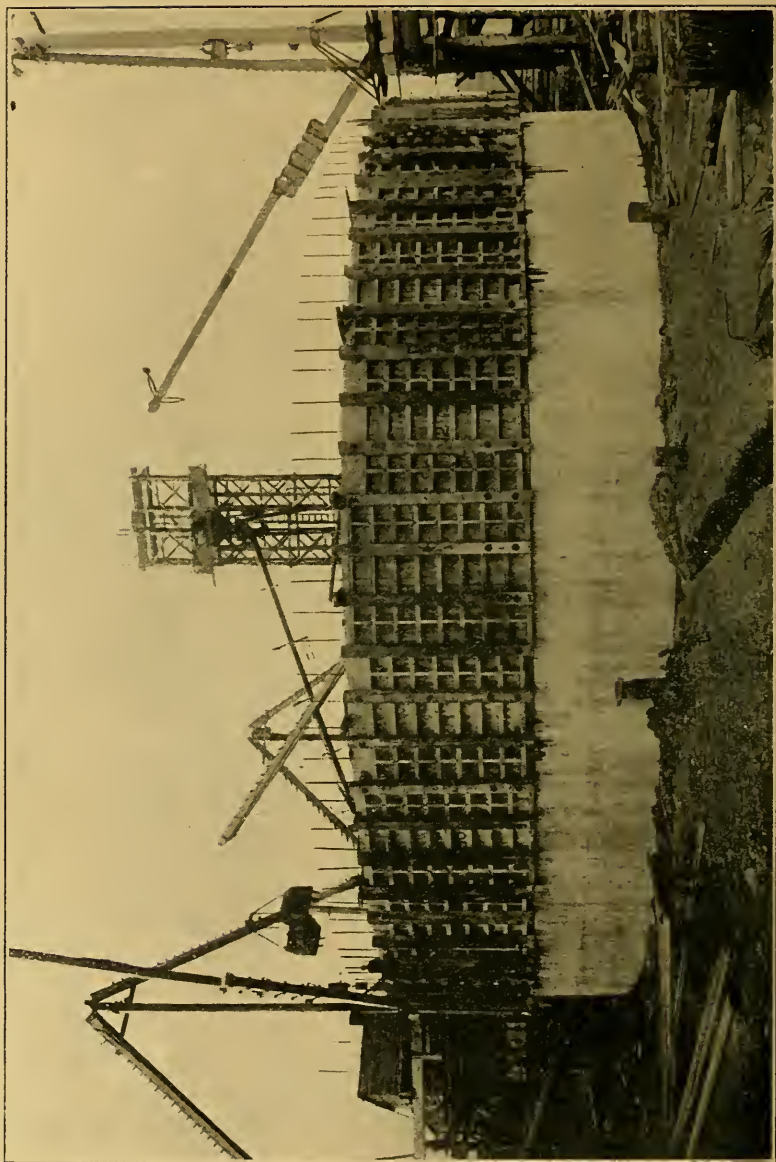
A Venturi tube is to be installed on the outfall, with the record-chart and register located on one of the main switch board panels. The 60-inch gate valve, electrically operated, will be installed in a gate house at the discharge end of the venturi tube.

The building will contain a complete system of heating, ventilating and plumbing, including toilets and shower baths.

The State Board of Health approved of the plans, for the plant itself, leaving the question of the location of the outfall to be decided later, so construction was started about the first of last year, 1919. The substructure is a reinforced concrete caisson 80 feet inside diameter and 45 feet deep. The cylindrical shell forming the outside wall is constructed of a series of rings ten feet high. The rings were cast above ground and after the concrete in each ring had properly set, the forms were removed and the ring sunk until the top was approximately a foot above ground. The forms were then re-assembled and the next section cast. When the caisson had reached the predetermined depth the bottom was placed under water. After the concrete bottom had set, the caisson was unwatered, the bottom made smooth and finished to a surface. This part of the work is finished and the inside walls, partitions, beams and floor slabs are now being built. The rectangular superstructure will be constructed of tapestry brick with stone trimmings and a red tile roof.

The lowest ring, which contains 475 cu. yds. of 1-2-4 concrete and thirty tons of steel, was completed in March of last year. After a few days the forms were removed and set for the second ring. The same forms were used for all five rings. The second, third and fourth rings, each containing 500 cu. yds. of concrete and 16 tons of steel, were finished by June 1st, the concrete being poured in continuous operations of about eight hours for each ring.

After the first ring had been poured and the forms removed the ring was allowed to sink by excavating the material from the interior. Two three-quarter yard clam-shell buckets on two 65-foot boom stiff-leg derricks, set up on opposite sides of the caisson, averaged about 200 cu. yds. of excavation a day. One derrick was placed on the north side of the caisson, the other on



FORMS IN PLACE FOR SECOND RING, SHOWING ALL THREE DERRICKS AND CONCRETE TOWER.



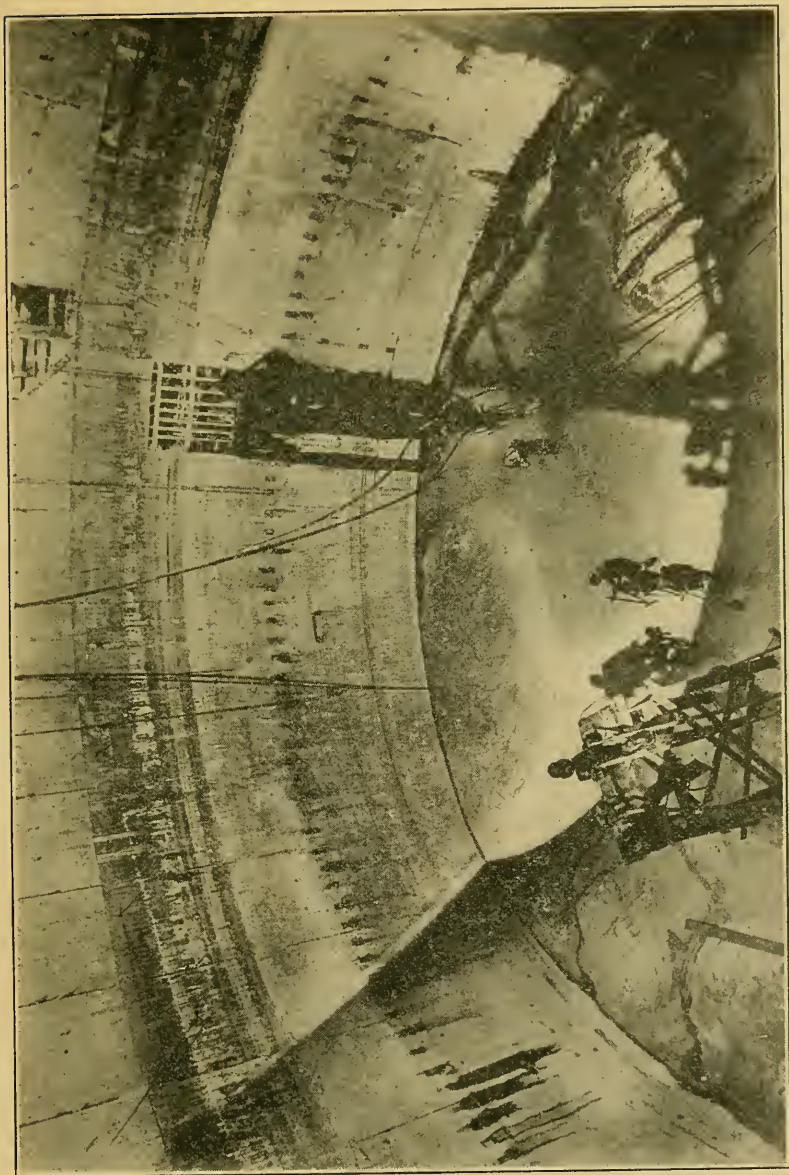
FORMS IN PLACE FOR THIRD RING. SHOWING PUMPS.

the south. On the east side, towards Bostwick Avenue were two one-yard mixers and an 80-foot double hoisting tower from which the concrete could be delivered through chutes to any part of the ring. Just north of the tower was another derrick which supplied gravel and sand to hoppers located above the mixers. As the excavation proceeded levels were taken at frequent intervals each day on the top of the shell and if one side was found to be sinking too fast, excavation was stopped on that side and continued near the other side until the ring was level again. At no time was the caisson more than nine inches out of level. At first it was not intended to keep the caisson dry during excavation, but as the work proceeded and it was seen that there was not much water coming in, pumps were installed and the interior was kept dry during this part of the work.

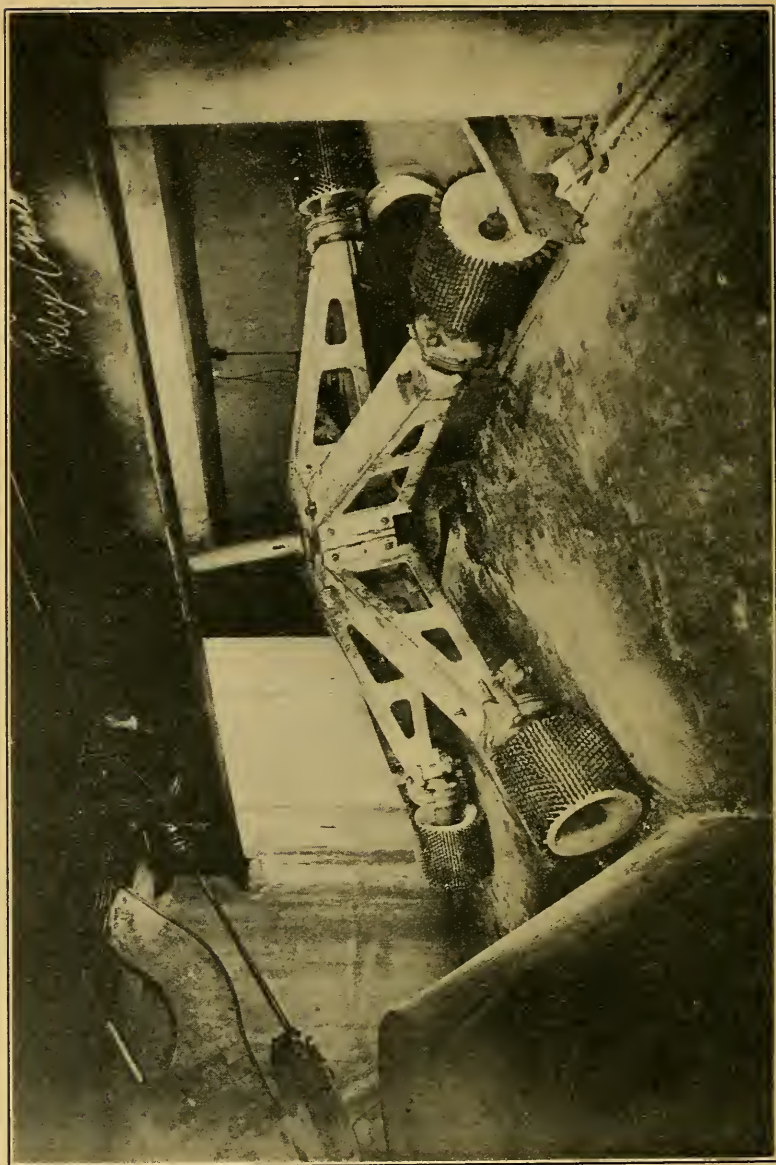
Several of the engineers who looked over the job before the contract was let said it would be almost impossible to sink this caisson, as the skin friction on the outside would hold it up. As a matter of fact it went down so easily that the top ring was left off until the caisson was within three feet of the bottom. Progress had been so satisfactory up to this point that an attempt was made to excavate still further and try to lay the bottom in the dry. It was found, however, that the pumps were drawing too much sand, which, flowing in from the outside under the bottom edge of the caisson was undermining the derricks and concrete tower. So the top ring was put on, the caisson was allowed to fill with water, and the excavation was continued until the ring was down to the predetermined depth and soundings showed that the excavation for the bottom was completed.

The bottom was then put in under water in one continuous operation. The same gang worked right through and put in 1800 cu. yds. of concrete in thirty-nine hours. The men were allowed to knock off occasionally for rest and refreshment, but the mixers were kept going continuously except when shut down for minor repairs. There was a two hour delay about noon of the first day, and the plant was shut down for about five hours at different times during the second day.

The bottom was allowed to stand three weeks, then the water was pumped out. No leaks were found so the floor was finished



SHOWING BOTTOM (PUT IN UNDER WATER) AFTER WATER HAD BEEN PUMPED OUT.



RIENSCH-WURL SCREEN IN BRIDGEPORT PLANT.

and work was commenced on the forms for the inside walls and partitions.

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